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A Review of the Status of Tramping Lake Fish Stocks, 1977.

MANITOBA
DEPARTMENT OF NATURAL RESOURCES
Fisheries Branch

MS Report No. 82-12, 36pp.

89-00700/

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ABSTRACT

The study was conducted between July 12 and July 19, 1977 to determine the sport fish potential of Tramping Lake and to provide base-line biological and physical data to permit recommendations for the future management of the recreational fishery.

Results of the study indicated that the fish stocks in Tramping Lake are not suffering any adverse effects from the present level of exploitation.

Due to the low productivity of Tramping Lake, the fish resources may not be able to withstand a significant increase in angler harvest or support a viable commercial fishery. Further lodge development or private development should be viewed with caution.

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INTRODUCTION

Tramping Lake, located just outside the eastern boundary of the Grass River Provincial Park, is accessible only by aircraft or a 3 kilometer boat trip up the Grass River from Wekusko Falls campground on Provincial Highway # 392. Due to its restricted access, poor angling and the availability of alternative angling in the immediate area, Tramping Lake receives only moderate angling pressure.

Angling for walleye, *Stizostedion vitreum vitreum*, has never been good in terms of catch per unit effort (pers. comm., Regional Staff), however the walleye taken are large in comparison to other lakes in the region. The lake has been closed to commercial fishing since the late 1940's and it has been the Department's policy since that time that it be allocated to sport fishing.

Regional staff in Snow Lake have indicated that the majority of angling pressure on Tramping Lake comes from local residents in the area and guests of the Wekusko Falls Lodge. Tramping Lake is also subject to additional angling pressure from the Wekusko Falls campground and the three private cottages located on the lake. The Department also maintains a cabin on the lake as part of a wild fur research program.

Walleye and northern pike, *Esox lucius*, are the principal game fish caught by anglers. Lake trout, *Salvelinus namaycush* are available in the lake but are generally only taken by anglers that know the lake well enough to locate them. Incidental catches of whitefish, *Coregonus clupeaformis*,

are not uncommon, however Tramping Lake has a history of producing whitefish with a high infestation rate of *Triaenophorous crassus*.

The objectives of the study were to determine the sport fish potential of Tramping Lake and to provide baseline biological and physical data to permit recommendations for the future management of the recreational fishery.

The Study Area

Tramping Lake (54°40'N, 100°08'W) is situated 115 kilometers northeast of The Pas and is part of the Grass River system. Water enters Tramping Lake via the Grass River from Reed Lake and exits through the same into Wekusko Lake.

Tramping Lake is located in a predominantly volcanic rock and undifferentiated basic intrusives zone. Surface deposition in this area consist of granitic material with Precambrian outcrops, bogs, localized clay and grey wooded soils. The vegetation is predominantly coniferous species and some broad leaf types. The primary species in this northern coniferous forest are black spruce, *Picea mariana;* white spruce, *Picea glauca;* jackpine, *Pinus banksiana;* aspen, *Populus tremuloides;* and white birch, *Betula papyrifera* (Weir, 1960).

The lake is a long narrow lake with a surface area of only 2,016 hectares (7.8 sq. mi.). The shoreline is fairly regular with only four islands of relatively small size. The lake is deep, having a mean depth of 14.1 meters and a maximum depth of 24.4 meters (Fig. 1).

MATERIALS AND METHODS

The study was conducted between July 12 and July 19, 1977. Standard gangs composed of 45.7 meter (50 yd) each of 51 mm (2 in), 77 mm (3 in), 96 mm (3 3/4 in), 108 mm (4 1/4 in), 121 mm (4 3/4 in), 134 mm (5 1/4 in) mesh (stretched measure) gill nets were set in twelve locations (Figure 2). Time of set and lift as well as depth were recorded for each set. The average set time was 21 hours (range 17 - 25 hours) and included at least one period of darkness.

All species caught were sampled for fork length ($\pm$ 1 mm), round weight ($\pm$ 10 g) and sex. An attempt was made to sample 200 fish of each species. Otoliths were collected from burbot and lake trout and scales were collected from all remaining species for age determination. The structures were stored in envelopes marked with the sample information for later age determination. A total count by set and mesh size was made for all species caught.

Otoliths were mounted in epoxy, sectioned at 20 - 21 thousandths of an inch, mounted on a microscope slide and annuli counted on an image produced by a microprojector. Scales were mounted on microscope slides and annuli counted on an image produced by a microprojector.

Length-weight relationships were determined by the following power equation:

$$\log_e W = a + b (\log_e L)$$

where: W = round weight in grams
a = y - intercept
b = slope of the regression line
L = fork length in millimeters

The condition factors (CF), which indicate a relative measure of robustness, were calculated for each fish from the formula:

$$CF = \text{Weight} \times 10^5 / \text{Length}^3$$

Survival rates were calculated using both a regression model and methods outlined by Robson and Chapman (1961).

The bathymetric map was compiled during a previous undated survey by the Fisheries Branch. Morphometric calculations such as length of shoreline, total surface area, area of each depth contour and total lake volume were determined by the planimeter method according to Hutchinson (1957). Filterable residue (TDS) data was obtained from the Manitoba Fisheries Fact Book (Peters and Wall, 1979).

The morphaedaphic index (MEI) and maximum sustainable yield (MSY) were calculated according to Ryder's (1965) corrected formula for moderate to intensively fished lakes. The corrected regression formula for MSY was as follows:

$$MSY = 1.383 \ (MEI^{.47441})$$

Data from the morphometric calculations were converted to metric units for application in the above formula.

RESULTS

In the following sections, the lake morphometric data are described and presented in graphical form. The total catch is described in terms of catch by mesh size, species composition and relative abundance. Biological data are summarized for walleye, northern pike, and lake whitefish and are presented in graphical and tabular form.

MORPHOMETRY

The morphometric features of Tramping Lake are summarized below. Original contour mapping data and present calculations were converted to metric units. The bathymetric map is illustrated in Figure 1.

Total surface area (ha) = 2016

Maximum depth (m) = 24.4

Mean depth (m) = 14.1

Total volume ($m^3 \times 10^8$) = 2.8519

CATCH

A total of 1,367 fish were caught in 12 sets during the study (Table 1). Details on the catch and catch per unit effort for each species by mesh size are given in Table 2. Nine species were represented in the catch of which cisco made up 51% of the total fish caught. Walleye and pike comprised 10% and 4.8% respectively. The catch of lake trout and yellow perch was insignificant, comprising less than 1% of the total catch.

WALLEYE

Length-Weight Relationship

The length-weight relationship for walleye from Tramping Lake is shown as follows:

$$\log_e \text{Weight} = -12.9735 + 3.2614 (\log_e \text{Length})$$

The mean condition factor for Tramping Lake walleye was 1.14 (sexes combined).

Age Composition

The age-frequency distribution for walleye is illustrated in Figure 3 and shows a distribution skewed to the left. Details on the age-frequency distribution are given in Appendix 1. Walleye from Tramping Lake had a mean age of 6.4 years and ranged from 2 to 15 years (N = 134).

Length Frequencies

The length-frequency distribution is illustrated in Figure 4. Details on the length-frequency distribution are given in Appendix 4. Walleye from Tramping Lake had a mean fork length of 444 mm and ranged from 234 to 696 mm (N = 134).

Growth

Growth in length and weight from Tramping Lake walleye is illustrated in Figure 5. Walleye growth in Tramping Lake is compared to growth of similar exploited northern walleye populations in Figure 6. Walleye in Tramping Lake exhibited a positive allometric growth.

Sex Ratio

The female to male ratio for Tramping Lake walleye was 1.7:1 for the entire sample (Appendices 1 and 4). The data indicate no apparent shift or trend through successive years, however the sample size is small.

Survival

The catch curve for Tramping Lake walleye is shown in Figure 7. Due to the irregularity of the catch curve, a segment analysis as outlined by Robson and Chapman (1961) was used to calculate survival. The estimated survival rate for walleye was 59% (using ages 6 - 9). The linear regression method applied to the same segment also yielded a survival rate of 59%.

NORTHERN PIKE

Length-Weight Relationship

The length-weight relationship for northern pike from Tramping Lake is shown as follows:

$$\log_e \text{Weight} = -11.9726 + 3.0268 \ (\log_e \text{Length})$$

The mean condition factor for Tramping Lake northern pike was 0.75 (sexes combined).

Age Composition

The age-frequency distribution for northern pike is illustrated in Figure 3. Details on the age-frequency distribution are given in Appendix 2. Northern pike from Tramping Lake had a mean age of 7.3 years and ranged from 4 to 15 years (N = 64).

Length Frequencies

The length-frequency distribution is illustrated in Figure 4. Details on the length-frequency distribution are given in Appendix 5. Northern pike from Tramping Lake had a mean fork length of 601 mm and ranged from 378 to 980 mm (N = 64).

Growth

Growth in length and weight from Tramping Lake northern pike is illustrated in Figure 8. Northern pike growth in Tramping Lake is compared to growth of similar exploited northern pike populations in Figure 6. Northern pike in Tramping Lake exhibited a positive allometric growth.

Sex Ratio

The female to male sex ratio for Tramping Lake northern pike was 1.0:1 for the entire sample (Appendices 2 and 5). No trends were noted through successive years, however the sample size was small.

Survival

The catch curve for northern pike is shown in Figure 7. Due to the irregularity of the catch curve, a segment analysis as outlined by Robson and Chapman (1961) was used to calculate survival. The estimated survival rate for northern pike was 32% (using ages 7 - 9). The linear regression method applied to the same segment yielded a survival rate of 35%.

LAKE WHITEFISH

Length-Weight Relationship

The length-weight relationship for whitefish from Tramping Lake is shown as follows:

$$\log_e \text{Weight} = -11.9899 + 3.1318 \ (\log_e \text{Length})$$

The mean condition factor for Tramping Lake whitefish was 1.36 (sexes combined).

Age Composition

The age-frequency distribution for whitefish is illustrated in Figure 3 and shows a distribution skewed to the left with a large decrease in numbers at age 9. Details on the age-frequency distribution are given in Appendix 3. Whitefish from Tramping Lake had a mean age of 5.9 years and ranged from 2 to 12 years (N = 217).

Length Frequencies

The length-frequency distribution is illustrated in Figure 4. Details on the length-frequency distribution are given in Appendix 6. Whitefish from Tramping Lake had a mean fork length of 357 mm and ranged from 192 to 478 mm (N = 221).

Growth

Growth in length and weight for Tramping Lake whitefish is illustrated in Figure 9. Whitefish from Tramping Lake exhibited a positive allometric growth.

Sex Ratio

The female to male sex ratio for Tramping Lake whitefish was 1.6:1 for the entire sample (Appendices 3 and 6). The female to male ratio remained fairly constant for all age groups with the exception of age 4 where the ratio reached a maximum of 3.2 to 1.

Survival

The catch curve for whitefish is shown in Figure 7. The estimated survival rate using Robson and Chapman's (1961) method for all ages known was 32% (using ages 8 - 12). The linear regression method applied to the same ages yielded a result of 33%.

PRODUCTION

The mean depth of Tramping Lake (14.1 m) falls well within the range stated by Ryder et al (1974) as acceptable for calculating the morpho-edaphic index (MEI). The MEI for Tramping Lake was 7.09 which according to Adams and Olver (1977) falls within the range of a mesotrophic lake.

When the MEI was applied to Ryder's (1965) equation for maximum sustainable yield (MSY) a value of 7,000 kg/yr (3.50 kg/ha) was derived.

DISCUSSION

WALLEYE

The condition factor describes the length-weight relationship or the relative robustness of the fish. Condition factors will vary depending on gonadal condition, fullness of the gut, the amount of fat reserves and the degree of muscular development. The mean condition factor for Tramping Lake walleye is similar to those of walleye from lakes on the east side of Lake Winnipeg (Hagenson and O'Connor, 1980 and Hagenson and O'Connor, 1981) and Wekusko Lake (Blunt, 1976) indicating a similar quality of environment for walleye in these Precambrian Lakes.

A slope of 3.26 for the length-weight regression indicates a positive allometric growth for walleye from Tramping Lake. This positive allometric growth is likely due to a large supply of forage fish resulting in reduced competition for food. Ciscos comprised 51% of the total catch by numbers.

A comparison of walleye growth from Tramping Lake compared to other selected walleye populations is shown in Figure 6. The comparison is valid as all ages were determined from scales. It should be noted that age determination from scales tends to underestimate the ages of older fish (Campbell and Babaluk, 1979) therefore the growth rates shown may not be representative of the actual growth rate. Growth of walleye in Tramping Lake falls within the range of growth rates shown for a slow growing northern population and a fast growing southern population. Growth in length appears rapid until age 4, then becomes almost linear for the remaining age groups shown.

Analysis of the catch curve for walleye from Tramping Lake yielded an annual mortality rate of 41% (using ages 6 to 9). Colby et al (1979) summarized walleye data from various waters and listed annual mortality rates ranging from 13% to 84% with common mortality rates ranging between 40 to 55%. Tramping Lake walleye fall within this common range, however the actual mortality rate is likely lower due to the scale method of ageing which tends to underestimate the ages of older fish. Lysack (1980) calculated mortality rates of 64% (based on scale ages) for a heavily exploited walleye population from Cedar Lake, Manitoba.

Colby et al (1979) found that age groups 3 to 4 constituted the majority of the adult population vulnerable to sampling gear in most lakes examined in North America and that the numbers in age groups greater than 4 generally tend to decrease with each subsequent age group. They also found that the average life-expectancy of walleye in northern latitudes ranged from 12 to 15 years. Walleye from Tramping Lake followed a similar pattern with a modal age of 5 and maximum recorded age group of 15 years (Figure 3).

Length-frequency distribution of walleye from Tramping shown in Figure 4 show a normal distribution. The irregularities of the distribution may be attributed to year-to-year fluctuations in year class strengths. The modal length class of 400 - 449 mm is fairly strong in comparison to the other length classes, however this could be attributed to the large intervals (50 mm) used in grouping the length classes.

NORTHERN PIKE

The condition factor for northern pike from Tramping Lake was similar to that reported from Wekusko Lake (Blunt, 1976) and only slightly higher than those from lakes on the east side of Lake Winnipeg (Hagenson and O'Connor, 1980 and Hagenson and O'Connor, 1981). This would indicate a similar quality of environment for these Precambrian Lakes.

The length-weight relationship for northern pike from Tramping Lake indicates a slightly positive allometric growth. The condition factors increased with size indicating that growth in weight accelerates with increasing length.

A comparison of northern pike growth from Tramping Lake compared to other selected northern pike populations is shown in Figure 6. The comparison is valid as all ages were determined from scales for each population. Pike from Tramping Lake exhibit an almost linear growth rate for the ages shown, however the first three age groups are not represented in the sample. Northern pike growth from Tramping Lake is comparable to that of other similar lakes and faster than that exhibited by more northerly climates.

Analysis of the catch curves yielded an annual mortality rate ranging from 65 to 68%. Toner and Lawler (1969) stated that even when fishing pressure in northern pike populations is low, the total mortality appears to be 50%. Mortality rates for northern pike from Tramping Lake were higher than 50%, however the sample size is small and the results should be viewed with some caution.

The age-frequency distribution (Figure 3) for northern pike indicates the presence of two strong year classess, 6 - 7 years. Scott and Crossman (1973) summarized data on northern pike and gave life expectancies for northern pike ranging from 10 - 12 years for southern populations to as high as 24 - 26 years for arctic populations. Tramping Lake pike exhibited a maximum age of 15 years, falling within this range. Recent studies of age determination using scales have shown that true age interpretation by scales for northern pike is difficult therefore the age-frequency shown may not be representative of the actual age distribution.

PRODUCTIVITY

An estimate of the optimum sustainable angling yield (OSY) for selected study lakes offering moderate quality fishing in the Whiteshell was determined from a linear equation of MEI versus angling yield (Hagenson and O'Connor, 1978). The derived metric equation $OSY = 0.492 (MEI^{0.673})$, although it yielded a poor correlation, still provides a useful method for estimating the OSY for moderate quality fisheries as the data were based on a homogenous group of lakes and represents angling yield only.

The above formula was applied to the data from Tramping Lake and yielded an optimum sustainable angling yield of 1.838 kg/ha or 3,700 kg/yr.

Applying the Tramping Lake morphoedaphic index to Ryder's (1965) equation for maximum sustainable yield resulted in a MSY of 7,000 kg annually. Ryder's equation was based on data that included the total weight of all species harvested by angling, commercial and domestic fishing. As Tramping

Lake is restricted to angling and an insignificant domestic harvest only, some adjustment to the MSY is necessary. Based on catch data, sport species (walleye, pike and lake trout) represented 37% of the total catch by weight. If this figure is applied to the MSY it yields a total annual maximum yield for sport species of 2,600 kg. It is interesting at this point to note that the Ontario Ministry of Natural Resources allocates 30% of the MSY for commercial lodge development on walleye and pike lakes (Anonymous, 1979).

A review of the above estimates for the annual yield from Tramping Lake would indicate that the maximum sustainable angling yield would lie between 3,000 to 4,000 kg annually (figures are rounded off). Although this figure seems low, there are a few points to bear in mind when assessing Tramping Lake. The lake is relatively small (2,016 ha) with a high mean depth of 14.1 meters. This high mean depth indicates a limited euphotic-littoral zone which is important to fish production. Tramping Lake receives a very moderate level of angling pressure as a result of limited access, a history of low catch per unit of angling effort and availability of higher quality angling in the area, therefore its yearly harvest would likely not exceed the above maximum yield figures.

MANAGEMENT IMPLICATIONS

The results of this study indicate that walleye and northern pike populations in Tramping Lake are not suffering any adverse effects from the present level of exploitation. A review of the Master Angler Award records for 1978 - 80 indicates that a few trophy fish are taken in Tramping Lake each year with the majority of these being walleye.

Tramping Lake has a 7 unit light housekeeping lodge located on the Grass River at Wekusko Falls plus 3 privately owned cabins situated on the lake. A 108 unit provincial campground is also located at Wekusko Falls. Access to Tramping Lake is made via a 3.0 kilometer boat trip up the Grass River from Wekusko Falls. Although no creel census data is available, discussions with Regional and District staff indicate that the majority of angling from the lodge and campground occurs on Wekusko Lake rather than Tramping. No winter angling takes place on Tramping Lake due to access difficulties and hazardous ice conditions.

The low productivity of Tramping Lake would indicate that the fish resource may not be able to withstand a significant increase in angler harvest or support a viable commercial fishery, therefore further lodge or private development on the lake should be restricted.

RECOMMENDATIONS

1. Tramping Lake should be maintained in its present state of development. Due to its somewhat restricted access it offers a form of "wilderness experience" on a day use basis. Further development of lodge facilities, private cottaging and access roads should be viewed with caution.

2. No commercial fishing should be allowed unless the harvest is restricted to non-sport species. The economics of any rough fish removal program should be carefully considered as the whitefish in Tramping Lake are of cutter quality and the overall productivity of Tramping Lake is low.

ACKNOWLEDGEMENTS

The author wishes to express his appreciation to R.D. Sopuck for designing and supervising the project in 1977. Field work was conducted by G. McVittie, C. Scott, L. Hansen, and B. Wright.

Appreciation is expressed to all Department staff involved in analysis of data and ageing of samples. J.F. O'Connor and P.H. Wright provided criticism and suggestions on the manuscript.

Thanks are extended to C. Gray and K. Bulloch for an excellent job in typing this manuscript.

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Figure 1. Bathymetric map of Tramping Lake

Figure ?. Map of Tramping Lake showing gillnet locations

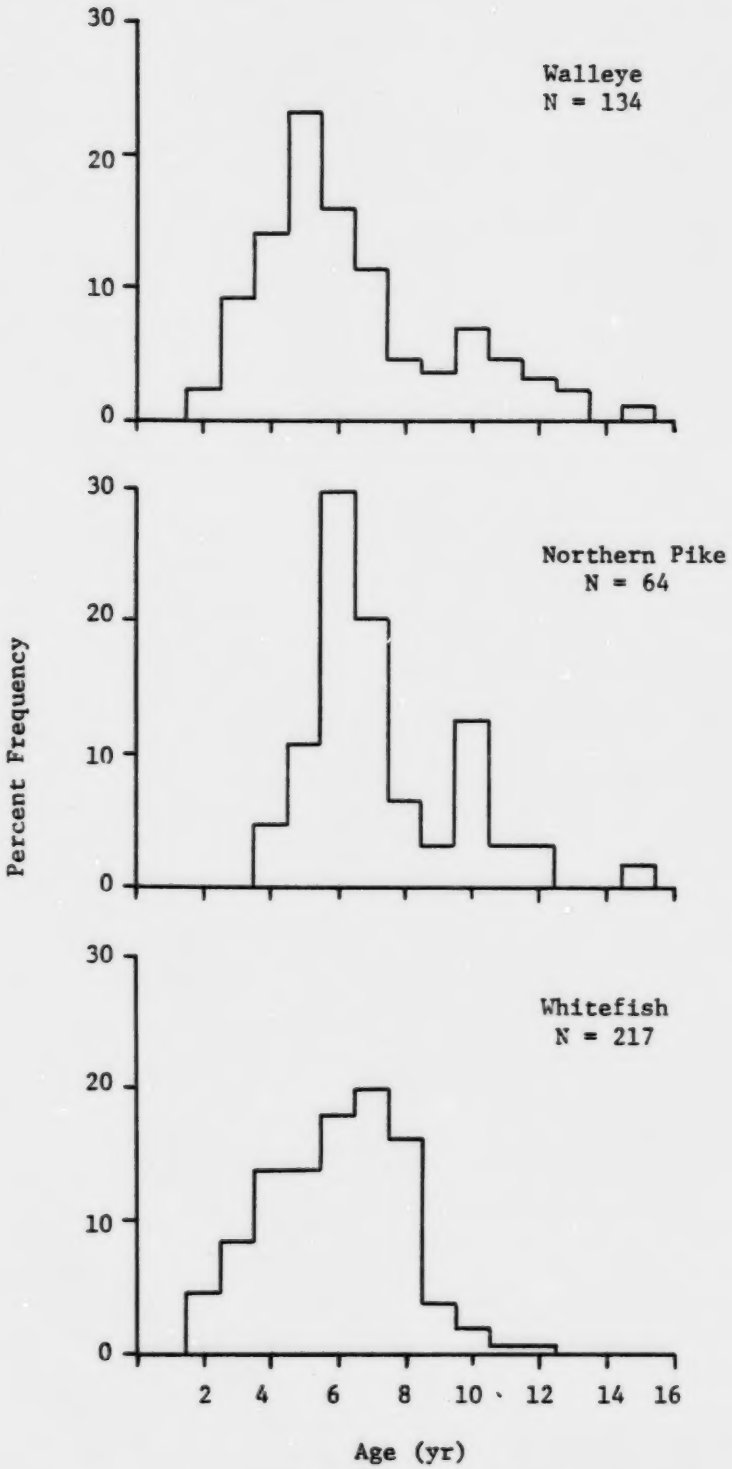

Figure 3. Age-frequency distributions for walleye, northern pike and whitefish from experimental nets, Tramping Lake, 1977.

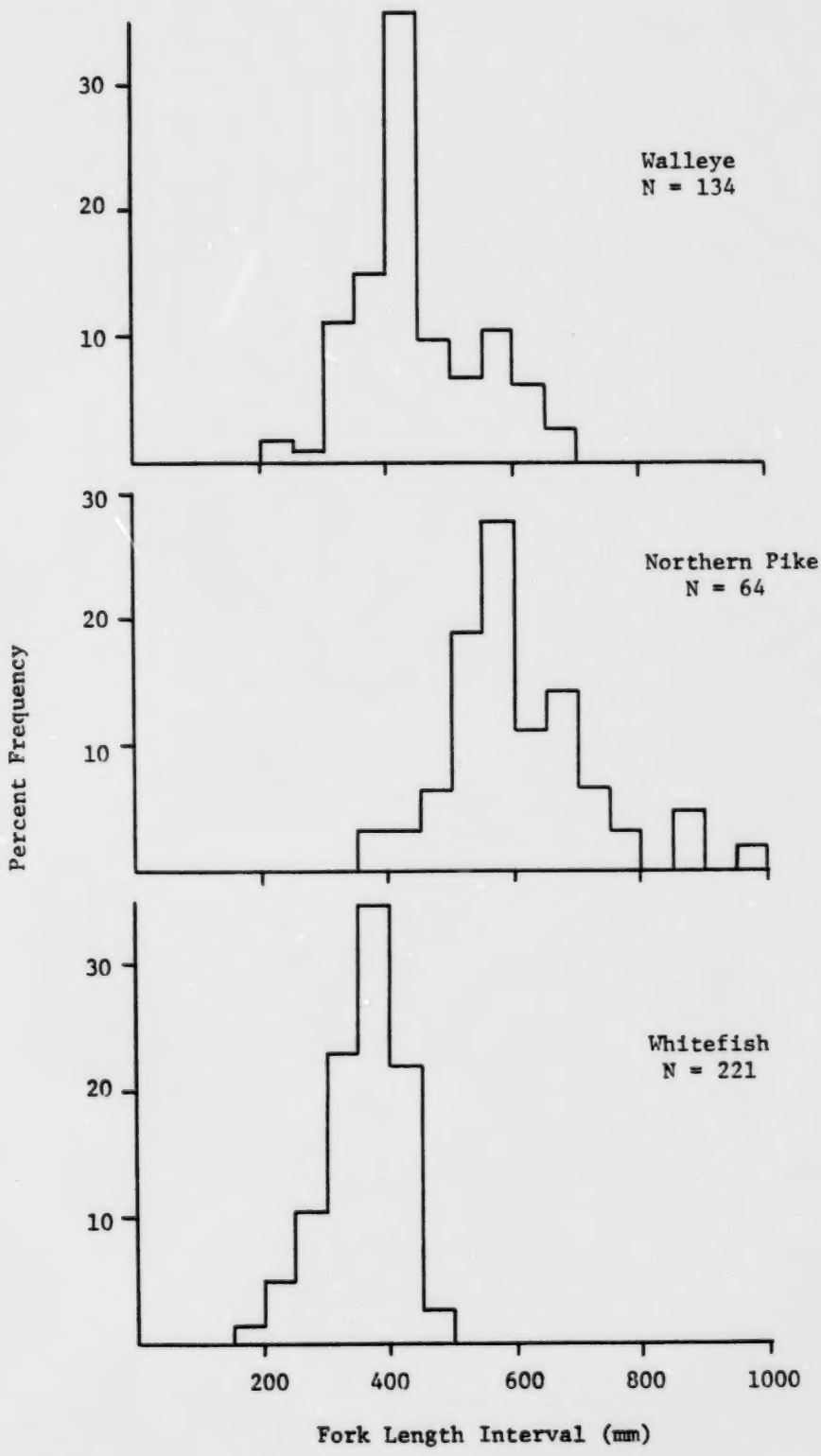

Figure 4. Length-frequency distributions for walleye, northern pike and whitefish from experimental nets, Tramping Lake, 1977.

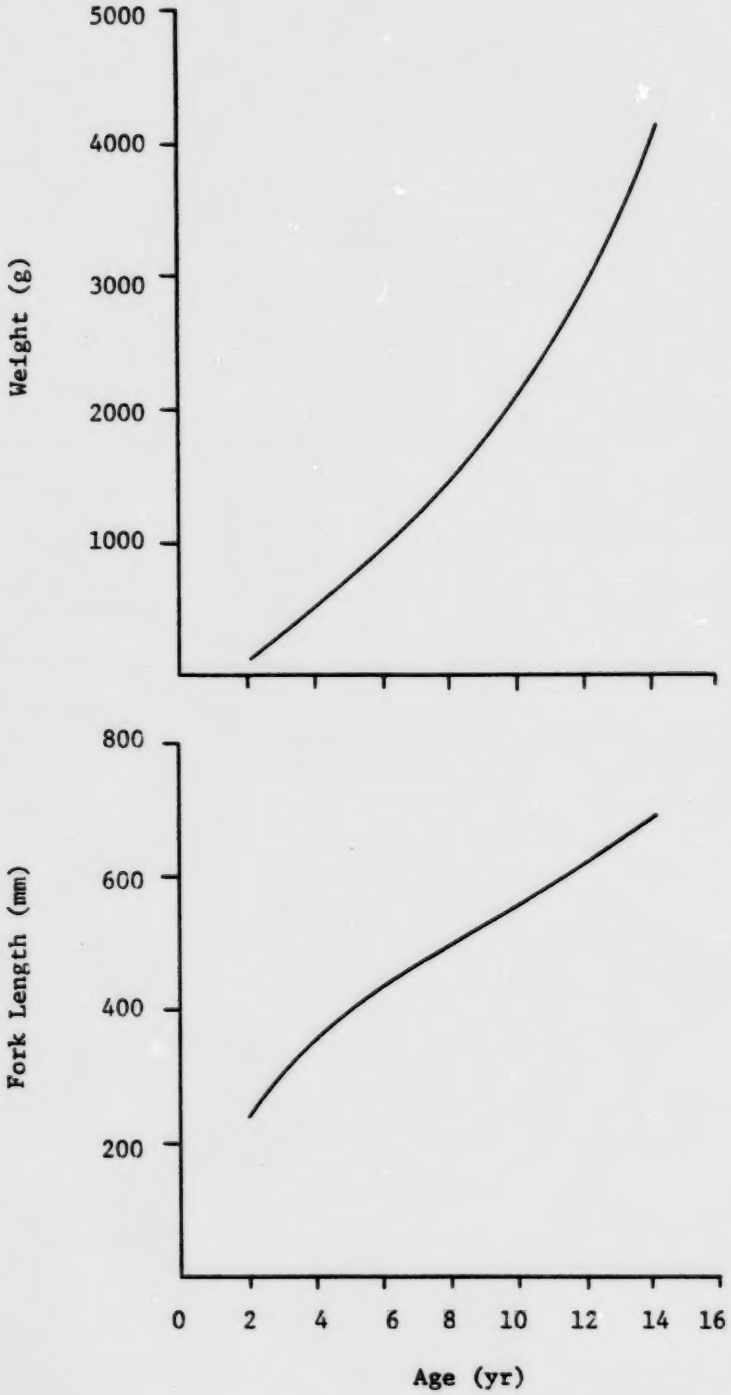

Figure 5. Growth in length and weight of walleye from experimental nets, Tramping Lake, 1977.

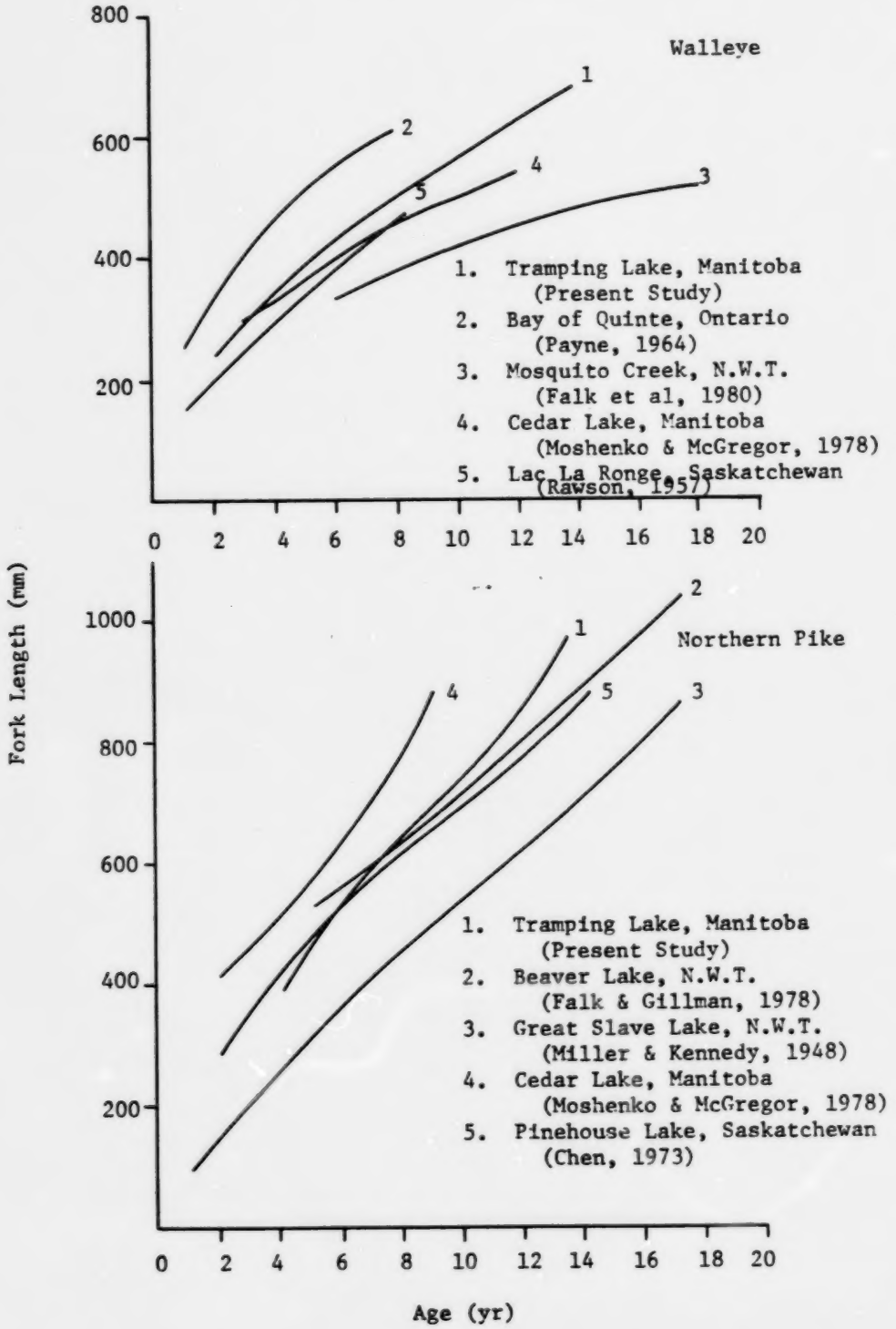

Figure 6. Comparison of walleye and northern pike growth rates to those of other North American populations.

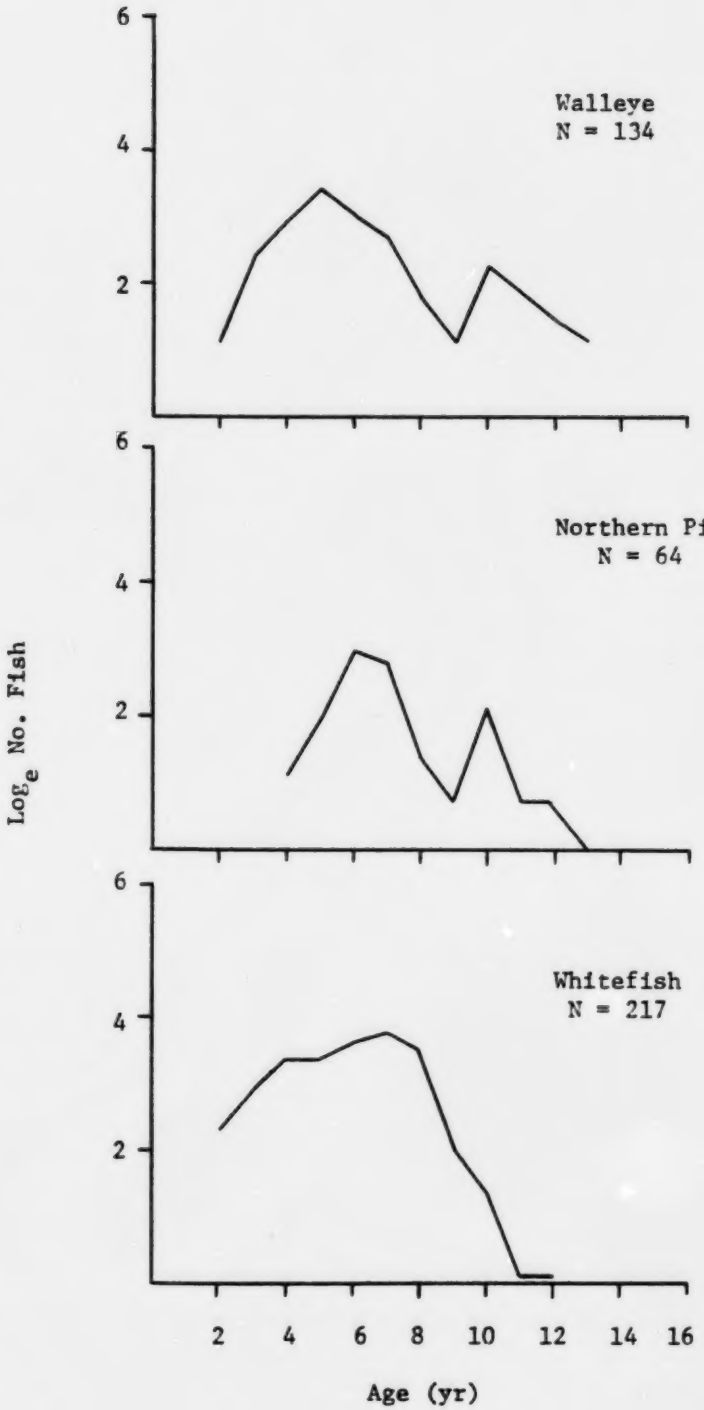

Figure 7. Catch curves for walleye, northern pike and whitefish from experimental nets, Tramping Lake, 1977.

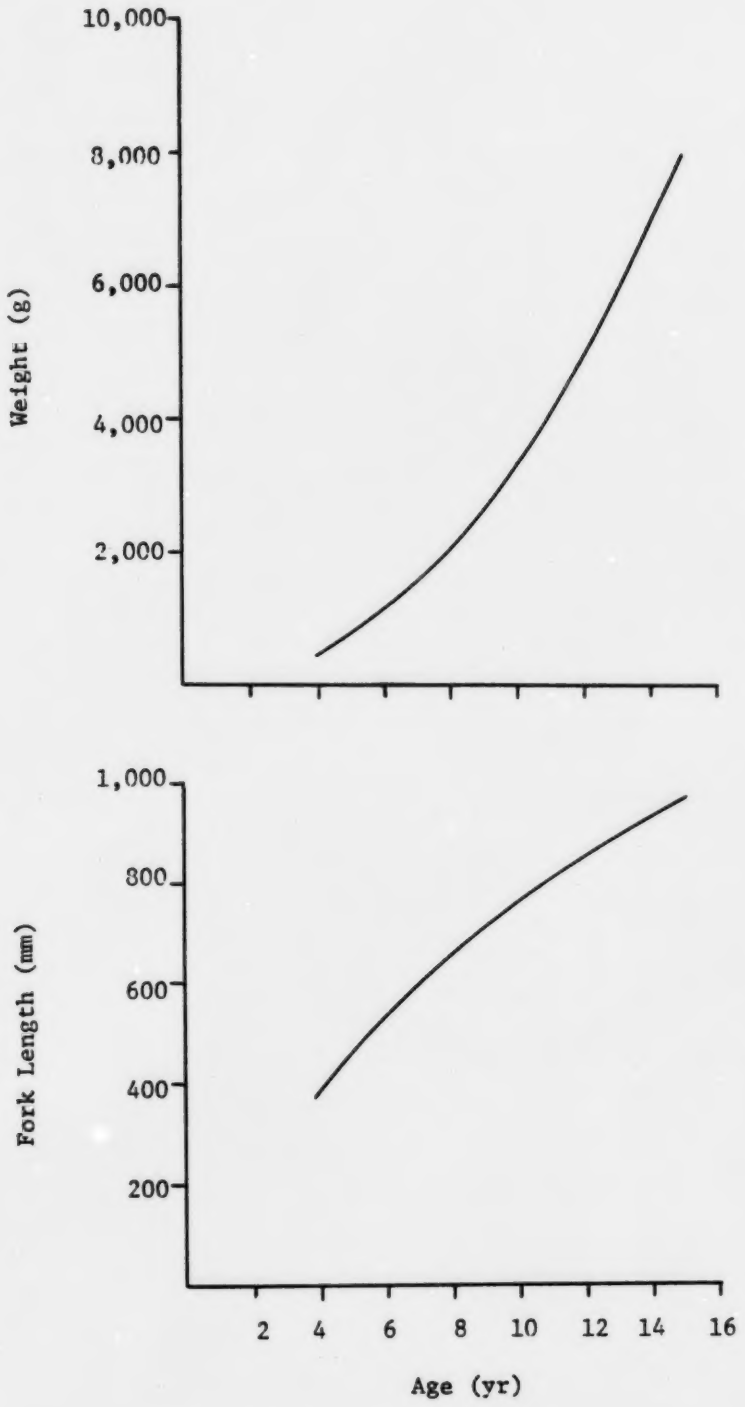

Figure 8. Growth in length and weight of northern pike from experimental nets, Tramping Lake, 1977.

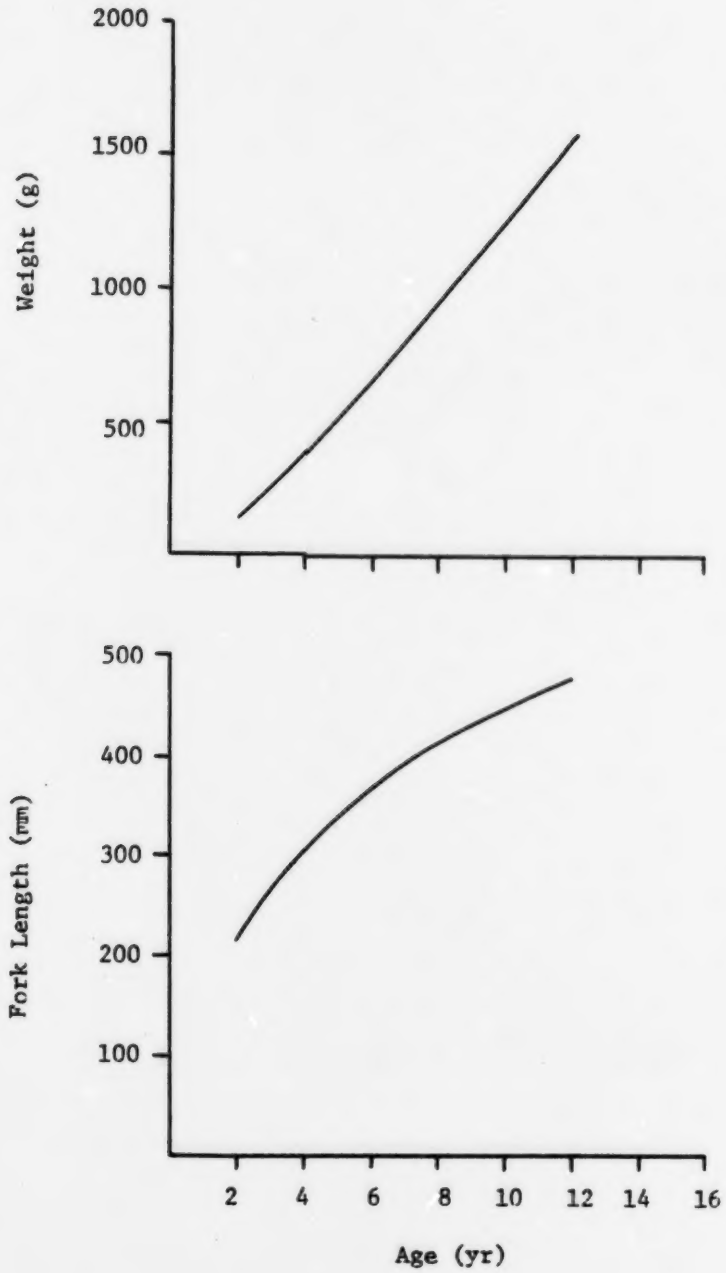

Figure 9. Growth in length and weight of whitefish from experimental nets, Tramping Lake, 1977.

TABLE 1. Total catch for each species by set location from experimental nets, Tramping Lake, 1977.

Species	Set Location												Total	
	1	2	3	4	5	6	7	8	9	10	11	12		
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Wt(kg)
Walleye (*Stizostedion vitreum*)	5	4	10	25	3	3	4	3	55	20	1	3	136	156.2[a]
Northern pike (*Esox lucius*)	7	5	9	12	5	5	-	2	10	6	3	1	65	117.8[a]
Whitefish (*Coregonus clupeaformis*)	4	4	30	2	52	13	18	19	17	7	45	17	228	147.8[a]
Longnose sucker (*Catastomus catastomus*)	-	2	-	-	7	-	5	7	2	-	2	-	25	49.0
White sucker (*Catastomus commersoni*)	11	23	11	19	8	27	6	31	18	19	1	2	176	131.0
Cisco (*Coregonus artedii*)	51	13	48	7	65	34	99	93	11	106	133	32	692	149.4[a]
Burbot (*Lota lota*)	-	-	-	2	1	-	9	6	11	-	6	-	35	59.5
Lake trout (*Salvelinus namaycush*)	-	-	-	-	-	-	3	-	-	-	4	-	7	42.4
Perch (*Perca flavescens*)	2	-	-	-	-	-	-	-	1	-	-	-	3	-
Total	80	51	108	67	141	82	144	161	125	158	195	55	1367	853.2

[a] Total weight was calculated from mean weights for sampled portion of catch

TABLE 2. Total catch and catch per 100 yards for each species by mesh size from experimental nets, Tramping Lake, 1977.

Species	51 mm (2")		77 mm (3")		96 mm(3 3/4")		108 mm(4 1/4")		121 mm(4 3/4")		133 mm(5 1/4")		Total	
	No.	No/100 yd	No.	No/100 yd	No.	No/100 yd	No.	No/100 yd	No.	No/100 yd	No.	No/100 yd	No.	No/100 yd
Walleye	42	7.0	46	7.7	16	2.7	11	1.8	6	1.0	15	2.5	136	3.8
Northern pike	11	1.8	29	4.8	19	3.2	5	0.8	1	0.2	-	-	65	1.8
Whitefish	36	6.0	53	8.8	47	7.8	26	4.3	52	8.7	14	2.3	228	6.3
Longnose sucker	-	-	1	0.2	2	0.3	1	0.2	4	0.7	17	2.8	25	0.7
White sucker	41	6.8	59	9.8	52	8.7	8	1.3	11	1.8	5	0.8	176	4.9
Cisco	620	103.3	45	7.5	5	0.8	3	0.5	6	1.0	13	2.2	692	19.2
Burbot	-	-	1	0.2	6	1.0	6	1.0	9	1.5	13	2.2	35	1.0
Lake trout	-	-	-	-	-	-	-	-	3	0.5	4	0.7	7	0.2
Perch	3	0.5	-	-	-	-	-	-	-	-	-	-	3	0.1
Total	753	125.5	234	39.0	147	24.5	60	10.0	92	15.3	81	13.5	1367	38.0

APPENDIX 1. Mean fork length, mean round weight, condition factor and sex ratio by age for walleye from experimental nets, Tramping Lake, 1979.

Age (Yr)	No.	Fork Length (mm) Mean	Fork Length (mm) SD	Weight (g) Mean	Weight (g) SD	Condition Factor	No. Males	No. Females	F/M Ratio	No. Sex Unknown
2	3	247	17.0	142	52.0	0.92	-	1	-	2
3	11	315	15.7	327	71.1	1.04	3	3	1.0	5
4	19	369	28.8	556	132.4	1.08	2	9	4.5	8
5	31	415	17.5	809	106.5	1.13	10	21	2.1	-
6	21	431	25.6	922	155.0	1.15	8	11	1.4	2
7	15	470	43.2	1273	358.6	1.20	5	10	2.0	-
8	6	495	20.6	1449	236.2	1.19	3	2	0.7	1
9	5	518	77.6	1680	633.0	1.17	3	2	0.7	-
10	9	567	19.6	2241	324.6	1.22	5	4	0.8	-
11	6	598	34.1	2704	463.3	1.26	1	5	5.0	-
12	4	600	24.6	2575	86.6	1.20	1	3	3.0	-
13	3	649	21.9	3383	682.5	1.23	2	1	0.5	-
15	1	696	-	4150	-	1.23	-	1	-	-
Total	134						43	73	1.7	18
Mean	6.4[a]	444	93.3	1166	818.4	1.14				

[a]indicates mean age

APPENDIX 2. Mean fork length, mean round weight, condition factor and sex ratio by age for northern pike from experimental nets, Tramping Lake, 1977.

Age (Yr)	No.	Fork Length (mm) Mean	Fork Length (mm) SD	Weight (g) Mean	Weight (g) SD	Condition Factor	No. Males	No. Females	F/M Ratio	No. Sex Unknown
4	3	392	19.1	500	50.0	0.83	1	-	-	2
5	7	483	32.9	849	145.7	0.75	5	1	0.3	1
6	19	545	26.3	1166	120.4	0.72	10	9	0.9	-
7	16	591	24.3	1516	190.4	0.73	8	8	1.0	-
8	4	663	10.4	2244	263.3	0.77	1	3	3.0	-
9	2	692	51.6	2500	424.3	0.75	-	2	-	-
10	8	712	31.7	2894	346.9	0.80	5	3	0.6	-
11	2	818	57.3	4863	548.0	0.89	1	1	1.0	-
12	2	861	5.7	4600	70.7	0.72	-	2	-	-
15	1	980	-	7950	-	0.84	-	1	-	-
Total	64						31	30	1.0	3
Mean	7.3[a]	601	115.0	1841	1299.0	0.75				

[a]indicates mean age

APPENDIX 3. Mean fork length, mean round weight, condition factor and sex ratio by age for lake whitefish from experimental nets, Tramping Lake, 1977.

Age (Yr)	No.	Fork Length (mm) Mean	Fork Length (mm) SD	Weight (g) Mean	Weight (g) SD	Condition Factor	No. Males	No. Females	F/M Ratio	No. Sex Unknown
2	10	217	17.9	130	25.8	1.29	-	3	-	7
3	18	262	15.8	225	39.3	1.25	2	3	1.5	13
4	30	310	18.5	378	57.2	1.27	5	16	3.2	9
5	30	340	12.6	532	63.1	1.35	9	18	2.0	3
6	37	366	16.6	677	109.5	1.37	15	21	1.4	1
7	43	395	16.4	875	80.6	1.42	15	28	1.9	-
8	35	412	19.4	954	111.2	1.37	15	20	1.3	-
9	8	431	18.4	1121	144.6	1.40	5	3	0.6	-
10	4	441	8.7	1138	47.9	1.33	2	2	1.0	-
11	1	467	-	1450	-	1.42	1	-	-	-
12	1	478	-	1450	-	1.33	-	1	-	-
Total	217						69	115	1.7	33
Mean	5.9[a]	357	59.5	669	300.5	1.35				

[a]indicates mean age

APPENDIX 4. Mean fork length, mean round weight, condition factor and sex ratio by length interval for walleye from experimental nets, Tramping Lake, 1977.

Length Interval (mm)	No.	Fork Length (mm)		Weight (g)		Condition Factor	No. Males	No. Females	F/M Ratio	No. Sex Unknown
		Mean	SD	Mean	SD					
200 - 249	2	237	4.2	113	17.7	0.84	-	1	-	1
250 - 299	1	266	-	200	-	1.06	-	-	-	1
300 - 349	15	316	14.1	324	48.1	1.02	3	5	1.7	7
350 - 399	20	381	11.8	629	69.7	1.13	5	9	1.8	6
400 - 449	49	422	13.3	863	115.2	1.15	16	31	1.9	2
450 - 499	13	474	16.5	1230	239.3	1.15	6	6	1.0	1
500 - 549	9	516	12.5	1656	210.9	1.20	4	5	1.3	-
550 - 599	14	567	10.8	2198	249.3	1.20	6	8	1.3	-
600 - 649	8	619	12.4	2834	268.9	1.20	2	6	3.0	-
650 - 699	3	673	20.2	3900	229.1	1.28	1	2	2.0	-
Total	134						43	73	1.7	18
Mean		444	93.3	1166	818.4	1.14				

APPENDIX 5. Mean fork length, mean round weight, condition factor and sex ratio by length interval for northern pike from experimental nets, Tramping Lake, 1977.

Length Interval (mm)	No.	Fork Length (mm)		Weight (g)		Condition Factor	No. Males	No. Females	F/M Ratio	No. Sex Unknown
		Mean	SD	Mean	SD					
350 - 399	2	382	4.9	475	35.4	0.86	-	-	-	2
400 - 449	2	419	7.1	600	70.7	0.81	1	-	-	1
450 - 499	4	481	12.7	855	155.2	0.76	3	1	0.3	-
500 - 549	12	523	10.4	1061	80.9	0.74	6	6	1.0	-
550 - 599	18	572	16.1	1333	159.7	0.71	10	8	0.8	-
600 - 649	7	612	15.2	1651	119.1	0.72	3	4	1.3	-
650 - 699	9	672	15.1	2425	293.2	0.79	5	4	0.8	-
700 - 749	4	729	12.7	2950	248.3	0.76	1	3	3.0	-
750 - 799	2	771	9.2	3988	698.4	0.87	1	1	1.0	-
850 - 899	3	860	4.4	4817	378.6	0.76	1	2	2.0	-
950 - 999	1	980	-	7950	-	0.84	-	1	-	-
Total	64						31	30	1.0	3
Mean		601	115.0	1841	1299.0	0.75				

APPENDIX 6. Mean fork length, mean round weight, condition factor and sex ratio by length interval for lake whitefish from experimental nets, Tramping Lake, 1977.

Length Interval (mm)	No.	Fork Length (mm)		Weight (g)		Condition Factor	No. Males	No. Females	F/M Ratio	No. Sex Unknown
		Mean	SD	Mean	SD					
150 - 199	3	196	3.2	117	28.9	1.55	-	1	-	2
200 - 249	11	231	13.8	155	35.0	1.23	-	3	-	8
250 - 299	23	274	14.9	262	48.0	1.26	4	5	1.3	14
300 - 349	51	328	14.2	472	78.5	1.36	12	30	2.5	9
350 - 399	78	377	14.9	758	121.9	1.40	32	45	1.4	1
400 - 449	49	419	12.5	999	93.9	1.36	20	29	1.5	-
450 - 499	6	461	11.2	1287	175.1	1.31	3	3	1.0	-
Total	221						71	116	1.6	34
Mean		357	59.6	669	301.3	1.36				